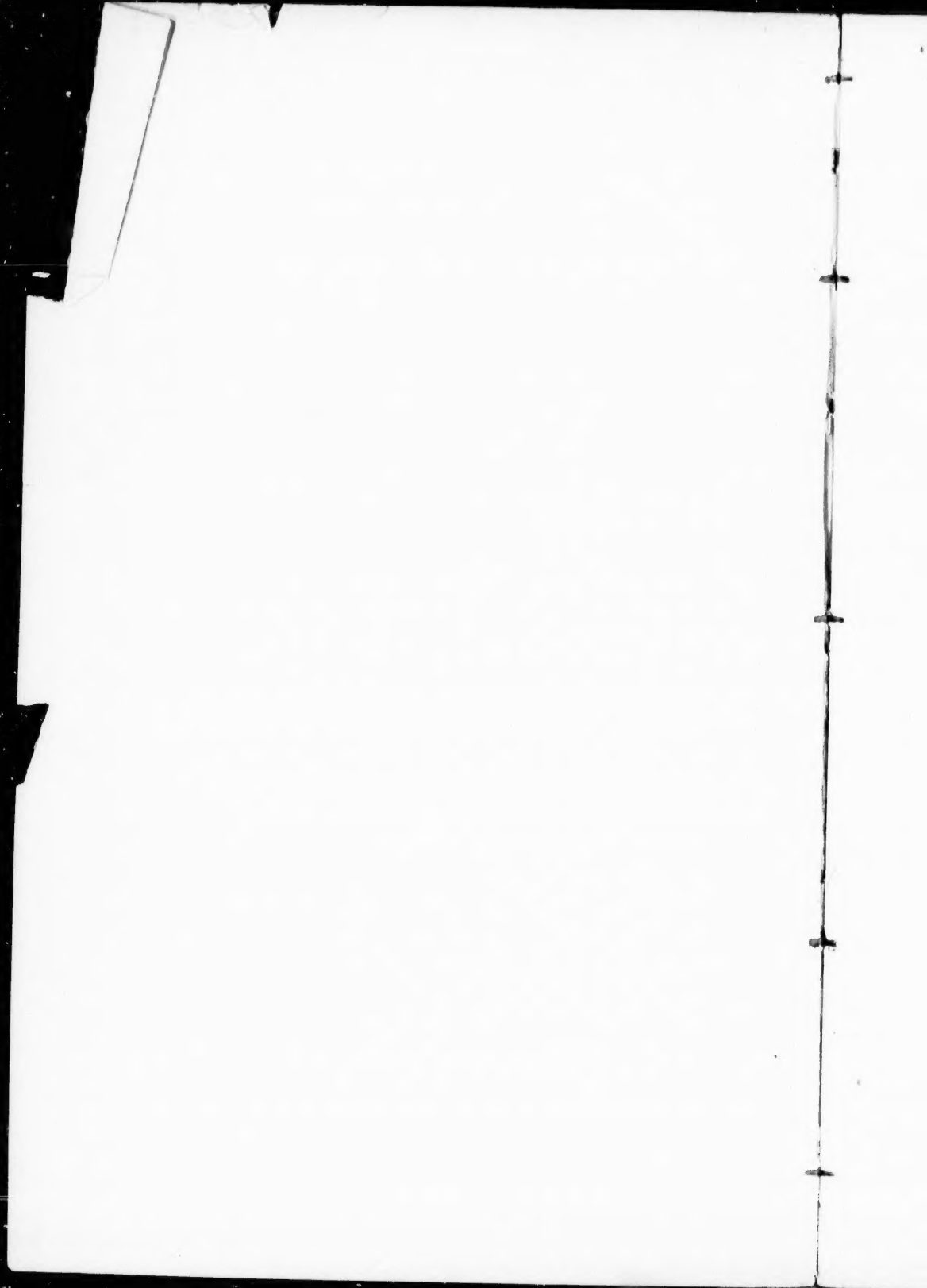


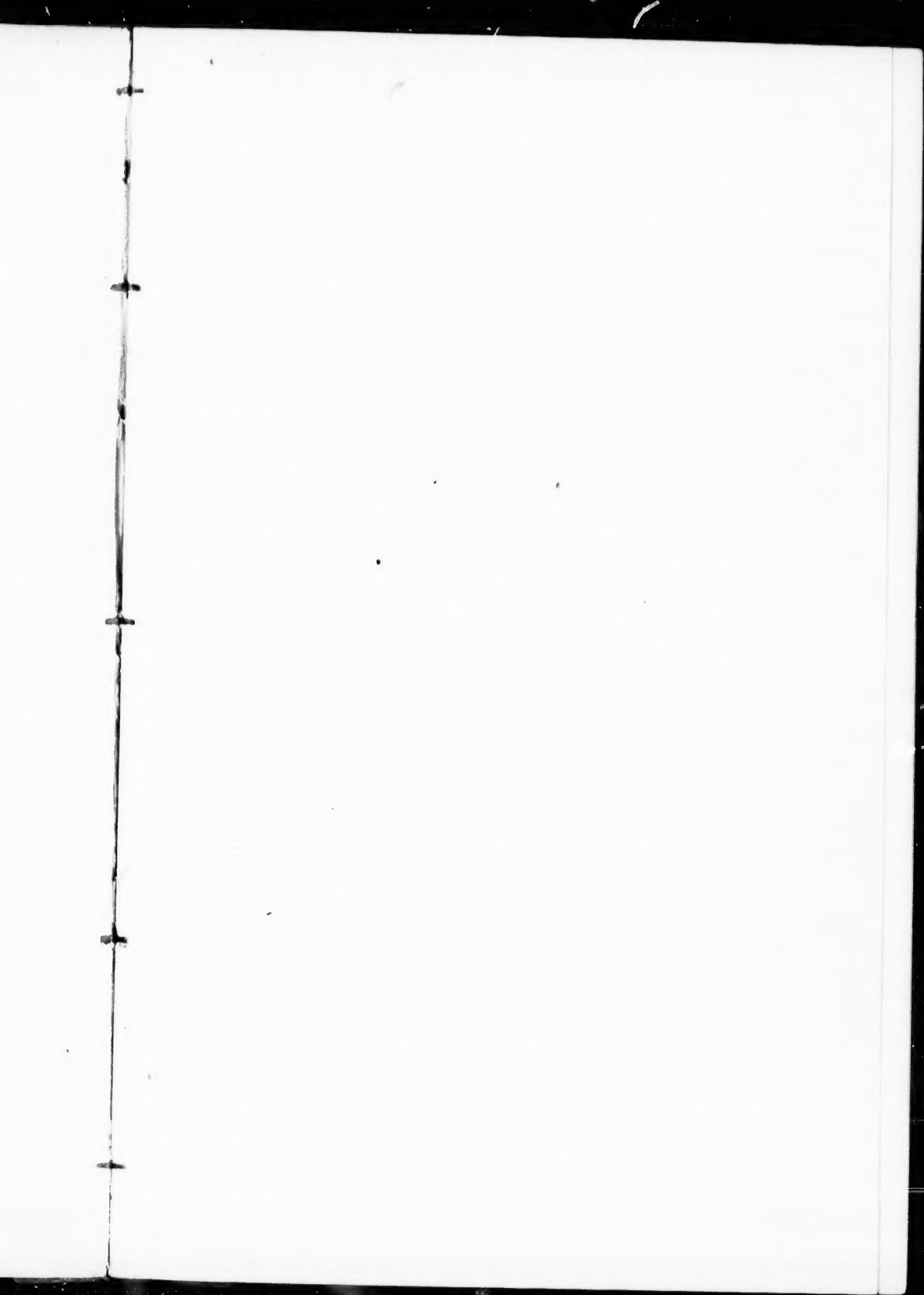
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ON
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NUMEROUS FRAGMENTS OF FIR-WOOD
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WITH
REMARKS ON THE ROCK-SPECIMENS BROUGHT FROM
THAT REGION.
BY
SIR RODERICK I. MURCHISON, D.C.L., F.R.S., V.P.G.S.,
Director-General of the Geological Survey.

[From the *QUARTERLY JOURNAL of the GEOLOGICAL SOCIETY of*
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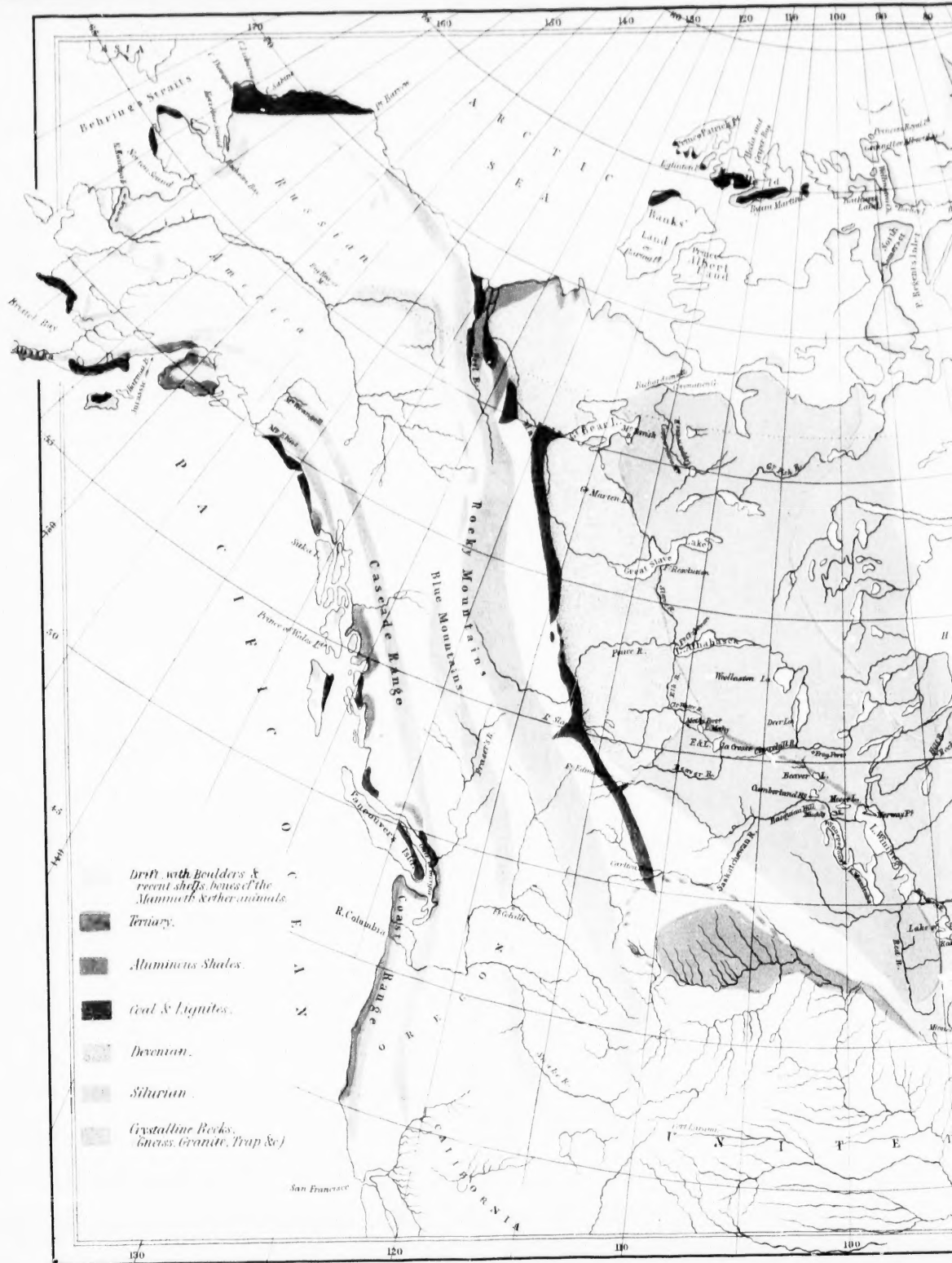
On the Occurrence of numerous Fragments of FIR-WOOD in the Islands of the ARCTIC ARCHIPELAGO; with Remarks on the ROCK-SPECIMENS brought from that Region. By SIR RODERICK IMPEY MURCHISON, D.C.L., F.R.S., V.P.G.S., Director-General of the Geological Survey.

ON the present occasion I cannot attempt to offer any general, still less any detailed description of the rocks and fossils of the north-western portion of that great Arctic Archipelago whose shores were first explored by Parry and Sabine. The specimens they brought home from Melville Island, and which were described by Mr. König, first conveyed to us the general knowledge of the existence there of fossiliferous limestones and other rocks analogous to known European types in Scandinavia. Since those early days, the voyages of Franklin, and of the various gallant officers who have been in search of our lamented friend, have amplified those views, and have shown us that over nearly the whole of the Arctic Archipelago these vast islands possess a structure similar to that of North America. We shall soon, I believe, be made acquainted with the characters of the specimens collected by the expedition under Sir Edward Belcher, who is preparing a description of the natural-history products of his survey. My chief object now is to call attention to the remarkable fact of the occurrence of considerable quantities of wood, capable of being used for fuel or other purposes, which exist in the interior, and on the high grounds of large islands in latitudes where the dwarf willow is now the only living shrub.

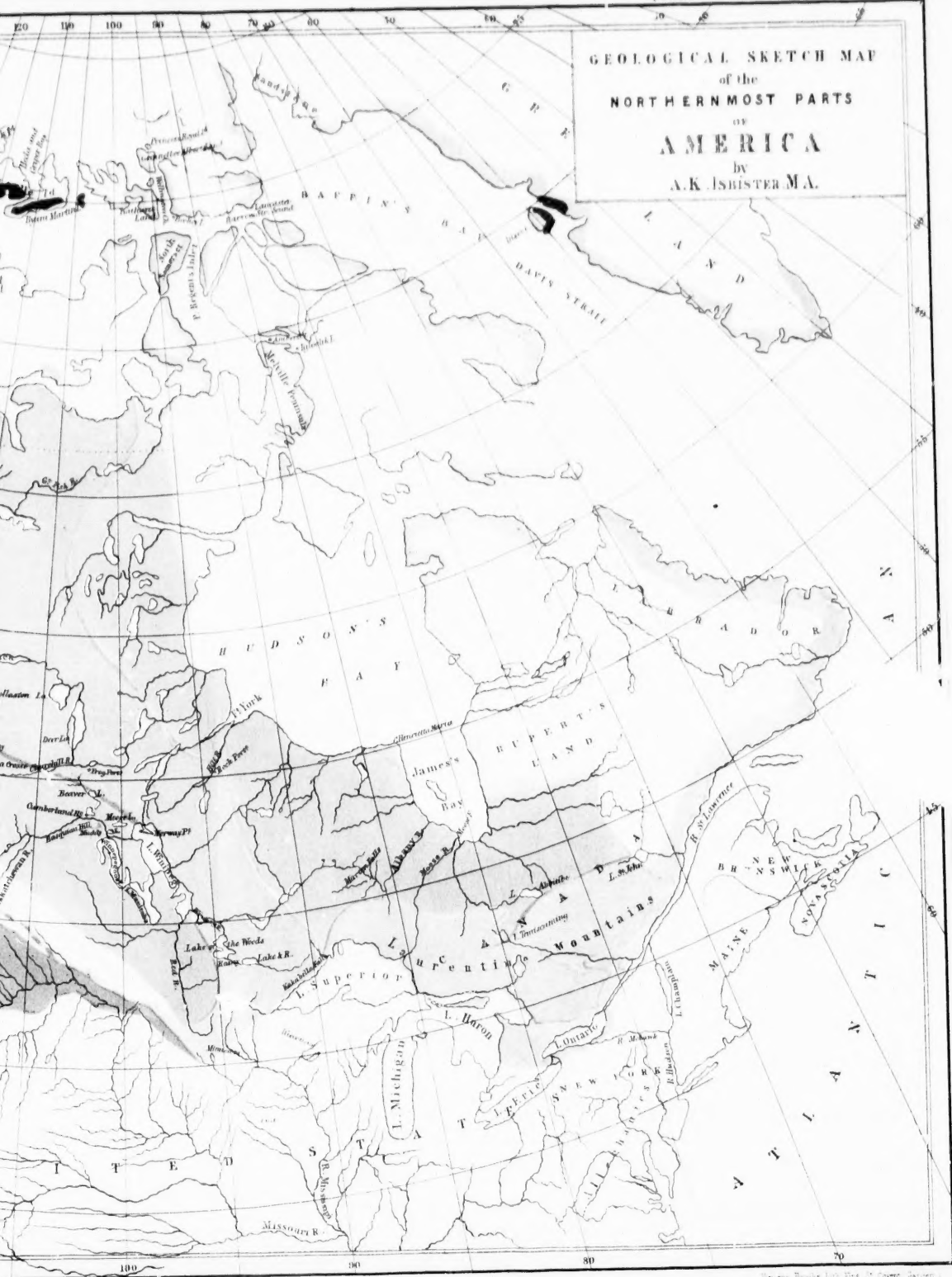
Before I allude to this phenomenon, as brought to my notice by Capt. McClure and Lieut. Pim, I would, however, briefly advert to a few rock-specimens collected by the latter officer in Beechey Island*, Bathurst Land, Eglinton Island, Melville Island, Prince Patrick's Island, and Banks's Land, where he joined Capt. McClure,—specimens which we ought to value highly, seeing that they were saved from loss under very trying circumstances.

From this collection, as well as from other sources to which I have had access, as derived from the voyages of Parry, Franklin, Back, Penny, Inglefield, and the recent work of Dr. P. Sutherland, I am led to believe that the oldest fossiliferous rock of the Arctic region is the Upper Silurian, viz. a limestone identical in composition and organic contents with the well-known rocks of Wenlock, Dudley, and Gothland.

* The reader is referred to the accompanying Geological Sketch-Map, taken from Mr. Isbister's memoir (Quart. Journ. Geol. Soc., Nov. 1855) on the Geology of the Northernmost parts of America, for a general view of the distribution of the crystalline rocks, Silurian limestones, and coal-bearing deposits of the Arctic lands.



GEOLOGICAL SKETCH MAP
of the
NORTHERNMOST PARTS
OF
AMERICA
by
A. K. JENKINS, M. A.



No clear evidence has been afforded as to the existence of Devonian rocks, though we have heard of red and brownish sandstone, as observed in very many localities by various explorers, and which possibly may belong to that formation. Thus, in North Somerset, to the south of Barrow Straits, red sandstone is associated with the older limestones. Byam Martin Island was described by Parry as essentially composed of sandstone, with some granitic and felspathic rocks; and, whilst the north-eastern face of Banks's Land is sandstone, its north-western cliffs consist (as made known by Capt. M'Clure) of limestone. But whilst in the fossils we have keys to the age of the Silurian rocks, we have as yet no adequate grounds whereon to form a rational conjecture as to the presence of the Old Red Sandstone, or Devonian group.

True Carboniferous *Producti* and *Spiriferi* have been brought home by Sir E. Belcher from Albert Land, north of Wellington Channel; and hence we may affirm positively, that the old Carboniferous rocks are also present. Here and there bituminous schist and coal are met with; the existence of the latter being marked at several points on the general chart published by the Admiralty. With the palæozoic rocks are associated others of igneous origin and of crystalline and metamorphosed character. Thus, from Eglinton Island to the south of Prince Patrick's Island, first defined by the survey of Capt. Kellett and his officers, we see concretions of greenstone, associated with siliceous or quartzose rocks and coarse ferruginous grits; and in Princess Royal Island, besides the characteristic Silurian limestones, there are black basalts and red jaspers, as well as red rocks, less altered by heat, but showing a passage into Jasper. Highly crystalline gypsum was also procured by Lieut. Pim from the north-western shores of Melville Island. In the collection before us there are silicified stems of plants, which Lieut. Pim gathered on various points between Wellington Channel on the east and Banks's Land on the west. Similar silicified plants were also brought home by Capt. M'Clure from Banks's Land; and, through the kindness of Mr. Barrow, to whom they were presented, they are now exhibited, together with a collection made by Capt. Kellett, which he sent to Dr. J. E. Gray of the British Museum, who has obligingly lent them for comparison.

I had requested Dr. Hooker to examine all those specimens which passed through my hands, and I learn from him that he will prepare a description of them, as well as of a great number from the same region, which had been sent to his father, Sir W. Hooker, associated, like those now under consideration, with fragments of recent wood.

Of Secondary formations no other evidence has been met with except some fossil bones of Saurians, brought home by Sir E. Belcher, from the smaller islands north of Wellington Channel; and of these fossils Sir Edward will give a description. Of the old Tertiary rocks, as characterized by their organic remains, no distinct traces have, as far as I am aware, been discovered; and hence we may infer that the ancient submarine sediments, having been elevated, remained during a very long period beyond the influence of depositary action.

Let us now see how the other facts, brought to our notice by the gallant Arctic explorers who have recently returned to our country, bear upon the relations of land and water in this Arctic region during the quasi-modern period, when the present species of trees were in existence.

Capt. M'Clure states that in Banks's Land, in latitude $74^{\circ} 48'$, and thence extending along a range of hills varying from 350 to 500 feet above the sea, and from half a mile to upwards inland, he found great quantities of wood, some of which was rotten and decomposed, but much of it sufficiently fresh to be cut up and used as fuel. Whenever this wood was in a well-preserved state, it was either detected in gullies or ravines, or had probably been recently exhumed from the frozen soil or ice. In such cases, and particularly on the northern faces of the slopes where the sun never acts, wood might be preserved any length of time, inasmuch as Capt. M'Clure tells me he has eaten beef, which, though hung up in his cold larder for two years, was perfectly untainted.

The most remarkable of these specimens of well-preserved recent wood is the segment of a tree, which, by Capt. M'Clure's orders, was sawn from a trunk sticking out of a ravine, and which is now exhibited*. It measures 3 feet 6 inches in circumference. Still more interesting is the cone of one of these fir-trees which he brought home, and which apparently belongs to an *Abies* resembling *A. alba*, a plant still living within the Arctic circle. One of Lieut. Pim's specimens of wood from Prince Patrick's Island is of the same character as that just mentioned, and in its microscopical characters much resembles *Pinus strobus*, the American Pine, according to Prof. Quekett, who refers another specimen, brought from Hecla and Griper Bay, to the Larch.

In like manner Lieut. Pim detected similar fragments of wood two degrees further to the north, in Prince Patrick's Land, and also in ravines of the interior of that island, where, as he informed me, a fragment was found, like the tree described by M'Clure, protruding from the soil on the side of a gully.

We learn, indeed, from Parry's 'Voyage,' that portions of a large fir-tree were found at some distance from the south shore of Melville Island, at about 30 feet above high-water mark, in latitude $74^{\circ} 59'$ and longitude $106^{\circ} \dagger$. According to the testimony of Capt. M'Clure and Lieut. Pim, all the timber they saw resembled the present drift-wood so well known to Arctic explorers, being irregularly distributed, and in a fragmentary condition, as if it had been broken up and floated to its present positions by water.

If such were the method by which the timber was distributed,

* Through the kindness of Mr. John Barrow, to whom it had been given, this wood, with some silicified stems, has been presented to the Museum of Practical Geology.

† "Serjeant Martin of the Artillery and Capt. Sabine's servant brought down to the beach several pieces of a large fir-tree, which they found nearly buried in the sand at the distance of 300 or 400 yards from the present high-water mark, and not less than 30 feet above the level of the sea."—Parry's Voyage for the Discovery of the North-West Passage, p. 68.

geologists can readily account for its present position in the interior of the Arctic Islands. They infer that at the period of such distribution large portions of these tracts were beneath the waters, and that the trees and cones were drifted from the nearest lands on which they grew. A subsequent elevation, by which these islands assumed their present configuration, would really be in perfect harmony with those great changes of relative level which we know to have occurred in the British Isles, Germany, Scandinavia, and Russia since the glacial period. The transportation of immense quantities of timber towards the North Pole, and its deposit on submarine rocks, is by no means so remarkable a phenomenon as the wide distribution of erratic blocks during the glacial epoch over Northern Germany, Central Russia, and large portions of our island when under water, followed by the rise of these vast masses into land. If we adopt this explanation, and look to the extreme cold of the Arctic region in the comparatively modern period during which this wood has been drifted or preserved, we can have no difficulty in accounting for the different states in which the timber is found. Those portions of it which happen to have been exposed to the alternations of frost and thaw, and the influence of the sun, have necessarily become rotten; whilst all those fragments which remained enclosed in frozen mud or ice which have never been melted would, when brought to light by the opening of ravines or other accidental causes, present just as fresh an appearance as the specimens now exhibited.

The only circumstance within my knowledge which militates against this view is one communicated to me by Capt. Sir Edward Belcher, who, in lat. $75^{\circ} 30'$, long. $92^{\circ} 15'$, observed on the east side of Wellington Channel the trunk of a fir-tree standing vertically, and which, being cleared of the surrounding earth, &c., was found to extend its roots into what he supposed to be the soil.

If from this observation we should be led to imagine that all the innumerable fragments of timber found in these polar latitudes belonged to trees that grew upon the spot, and on the ground over which they are now distributed, we should be driven to adopt the anomalous hypothesis, that, notwithstanding physical relations of land and water similar to those which now prevail (*i. e.* of great masses of land high above the sea), trees of large size grew on such *terra firma* within a few degrees of the North Pole!—a supposition which I consider to be wholly incompatible with the data in our possession, and at variance with the laws of isothermal lines.

If, however, we adopt the theory of a former submarine drift*, followed by a subsequent elevation of the sea-bottom, as easily accounting for all the phenomena, we may explain the curious case brought to our notice by Sir Edward Belcher, by supposing that the tree he uncovered had been floated away with its roots downwards, accompanied by attached and entangled mud and stones, and lodged

* Dr. Hooker informs me that all the specimens sent to him were collected in mounds of silt, rising up from the level of the sea to 100 feet or more above it; and he entirely coincides with me in the belief that the whole of this timber was drifted to the spots where it now lies.

in a bay, like certain "snags" of the great American rivers. Under this view, the case referred to must be considered as a mere exception, whilst the general inference we naturally draw is, that the vast quantities of broken recent timber, as observed by numerous explorers, were drifted to their present position when the islands of the Arctic Archipelago were submerged. This inference is indeed supported by the unanswerable evidence of the submarine associates of the timber; for, from the summit of Coxcomb Range in Banks's Land, and at a height of 500 feet above the sea, Capt. McClure brought home a fine large specimen of *Cyprina Islandica*, which is undistinguishable from the species so common in the glacial drift of the Clyde*; whilst Capt. Sir E. Belcher found the remains of whales on lands of considerable altitude in lat. 78° north.

Reasoning from such facts, all geologists are agreed in considering the shingle, mud, gravel, and beaches in which animals of the Arctic region are imbedded in many parts of Northern Europe, as decisive proofs of a period when a glacial sea covered large portions of such lands; and the only distinction between such deposits in Britain and those which were formed in the Arctic Circle, is, that the wood which was transported to the latter has been preserved in its ligneous state for thousands of years, through the excessive cold of the region.

P.L.—Since the above was written, Capt. Collinson transmitted to me an instructive collection of rock-specimens, collected during his survey. Most of them show the great prevalence of crystalline rocks along the north coast of America.

* In Parry's 'Voyages' (page 61) we learn that a number of marine shells, of the *Venus* tribe, were found imbedded in the ravines of Byam Martin's Island; a fact which strengthens the view here adopted of the submergence of large portions of these tracts at a very recent geological epoch.